```
Received: from mailhub.watson.ibm.com (9.2.250.97) by yktvmv.watson.ibm.com
   (IBM VM SMTP V2R4) with TCP; Sat, 22 Nov 97 17:36:58 EST
Received: from igw2.watson.ibm.com (igw2.watson.ibm.com [9.2.250.12]) by mailhub
Received: from prod.lexis-nexis.com (prod.lexis-nexis.com [138.12.4.30]) by igw2
Received: by prod.lexis-nexis.com id AA03698
  (InterLock SMTP Gateway 3.0 for dmorris@watson.ibm.com);
  Sat, 22 Nov 1997 17:36:59 -0500
Message-Id: <199711222236.AA03698@prod.lexis-nexis.com>
Received: by prod.lexis-nexis.com (Internal Mail Agent-1);
  Sat, 22 Nov 1997 17:36:59 -0500
Date: Sat, 22 Nov 97 17:36:58 EST
From: lexis-nexis@prod.lexis-nexis.com (LEXIS(R)/NEXIS(R) Print Delivery)
To: dmorris@watson.ibm.com
Subject: LEXIS(R)/NEXIS(R) Print Request Job 97085, 1 of 2
```

MORRIS, DAN
IBM CORPORATION
YORKTOWN PATENT OPERATIONS
T. J. WATSON RESEARCH CENTER
P.O. BOX 218
YORKTOWN HEIGHTS, NEW YORK 10598-0218
MAIL-IT REQUESTED: NOVEMBER 22, 1997 100G6J

CLIENT: 8774
LIBRARY: LEXPAT
FILE: UTIL

YOUR SEARCH REQUEST IS:
PEROVSKITE W/1 LIKE
AND SUPERCOND!

YOUR FOCUS SEARCH REQUEST AT THE TIME THIS MAIL-IT WAS REQUESTED:
PEROVSKITE W/1 LIKE

NUMBER OF PATENTS FOUND WITH YOUR FOCUS REQUEST:
107

DISPLAY FORMAT: KWIC

SEND TO: MORRIS, DAN
IBM CORPORATION
YORKTOWN PATENT OPERATIONS
T. J. WATSON RESEARCH CENTER
P.O. BOX 218
YORKTOWN HEIGHTS NEW YORK 10598-0218

************************************06089************************************

FOCUS - 1 OF 107 PATENTS

5,686,394

<=2> GET 1st DRAWING SHEET OF 1

Nov. 11, 1997

Process for manufacturing a superconducting composite

INVENTOR: Sibata, Kenichiro, Hyogo, Japan
Sasaki, Nobuyuki, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

SUM:
... Ho-Cu-O system or Ba-Dy-Cu-O system compound oxide which possess the quasi-perovskite type crystal structure including an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

C1

The abovementioned type superconductors can be prepared from a powder mixture Consisting of oxides and/or carbonates containing constituent elements of said superconductor. The powder mixture may include optionally oxides and/or carbonates of at least ...

FOCUS - 2 OF 107 PATENTS

5,679,980

<=2> GET 1st DRAWING SHEET OF 5

Oct. 21, 1997

Conductive exotic-nitride barrier layer for high-dielectric-constant material electrodes

INVENTOR: Summerfelt, Scott R., Dallas, Texas

DETDESC:

...
TABLE
...

* * Conductive perovskite like

FOCUS - 3 OF 107 PATENTS

5,665,628

<=2> GET 1st DRAWING SHEET OF 5

Sep. 9, 1997

Method of forming conductive amorphous-nitride barrier layer for high-dielectric-constant material electrodes

INVENTOR: Summerfelt, Scott R., Dallas, Texas

DETDESC:

...
TABLE
...

* * Conductive perovskite like

FOCUS - 4 OF 107 PATENTS

5,661,112

<=2> GET 1st DRAWING SHEET OF 3

Aug. 26, 1997

Superconductor

INVENTOR: Hatta, Shinichiro, 201-1028, Higashinakafuri-2-chome, Hirakata-shi, Japan
Higashino, Hidetaka, A2-505, 117, Hitotsuyacho, Matsubara-shi, Japan
Hirochi, Kumiko, 22, Keihanhondori-1-chome, Moriguchi-shi, Japan
Adachi, Hideaki, 3-1-505, Mitsuiminamimachi, Neyagawa-shi, Japan

... [*1] film being a transition metal element selected from Pt, Au, Ag, Pd, Ni and Ti the composition A-B-Cu-O of said oxide film being in the form of layered perovskite-like structure.

[*2] 2. A superconductor according to claim 1, wherein an additional metal film is formed on said oxide film, or the oxide films and metal films are laminated alternately to form a multi-layer structure.

[*3] ...

FOCUS - 5 OF 107 PATENTS

5,648,114

<=2> GET 1st DRAWING SHEET OF 4

Jul. 15, 1997

Chemical vapor deposition process for fabricating layered superlattice materials

INVENTOR: Paz De Araujo, Carlos A., Colorado Springs, Colorado
Watanabe, Hitoshi, Tokyo, Japan
Scott, Michael C., Colorado Springs, Colorado
Mihara, Takashi, Saitama, Japan

DETDESC:

... Layered superlattice materials may be summarized more generally under the formula: [See Original Patent for Chemical Structure Diagram]

where A1, A2 . . . A represent A-site elements in the perovskite-like structure, which may be elements such as strontium, calcium, barium, bismuth, lead, and others, S1, S2 . . . Sk represent super-lattice generator elements, which usually is bismuth, but can also be materials such as yttrium, scandium, lanthanum, antimony, chromium, thallium, and other elements with a valence of + 3, B1, B2 . . . BI represent B-site elements in the perovskite-like structure, which may be elements such as titanium, tantalum, hafnium, tungsten, niobium, zirconium, and other elements, and Q represents an anion, which may be elements such as oxygen, fluorine, chlorine and hybrids of these elements, such ...

... [*14] s2 > . . . Sk[xk]< + sk> B1[y1]< + b1> B2[y2]< + b2 > . . . Bl[yl]< + bl> Q[z]< - 2> , where A1, A2 . . . Aj represent A-site elements in a perovskite-like structure, S1, S2 . . . Sk represent superlattice generator elements, B1, B2 . . . Bl represent B-site elements in said perovskite-like structure, Q represents an anion, the superscripts indicate valences of the respective elements, the subscripts indicate an average number of atoms of the element in the unit cell, and at least w1 and y1 are non-zero, and wherein said A- ...

5,647,904

<=2> GET 1st DRAWING SHEET OF 2

Jul. 15, 1997

Method for manufacturing superconducting ceramics in a magnetic field

INVENTOR: Yamazaki, Shunpei, Tokyo, Japan

SUM:

... 30o K. by a method in which a mixture of chemicals in a suitable composition is compacted and fired. These superconducting ceramics form a quasi-molecular atomic unit in a perovskite-like structure whose unit cell is constructed with one layer in which electrons have essentially one-dimensional motion, whereas a number of crystalline grains are arranged at randam with diverse crystalline directions, and therefore the critical current density is ...

... cm from conventional several millimeters. The breadth and thickness may be more flexibly controlled by skilled persons according to the invention in comparison with the prior art technique.

Superconducting materials are constructed in perovskite-like structures as illustrated in FIG. 1 in accordance with the present invention. The structure comprises copper atoms 2, an intervening copper atom 3, oxygen atoms 5 and 6 surrounding the copper ...

C 3

DRWDESC:
BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram showing the configuration of the perovskite-like molecular sturcture in accordance with the present invention.

FIGS. 2(A) and 2(B) are top and side sectional views showing an apparatus for manufacturing superconducting ceramics in accordance with the present invention.

FOCUS - 7 OF 107 PATENTS

5,646,094

<=2> GET 1st DRAWING SHEET OF 4

Jul. 8, 1997

Rare earth substituted thallium-based superconductors

INVENTOR: Tallon, Jeffrey Lewis, 3 Marine Drive, York Bay, Eastbourne, New Zealand
Presland, Murray Robert, 4/1 Mahina Bay Road, Mahina Bay, Eastbourne, New Zealand

ABST:
... lanthanide rare earth elements and where 0.3 </= a,b </= 0.7, 0.05 </= c </= 1.1,2 - c </= d </= 1.95, 0.05 </= e </= 1, 1.9 </= f </= 2.1 and 6.5 </= g </= 7.5. These compounds, which are layered perovskite-like oxides, exhibit a high chemical stability, form readily into nearly single phase, do not require adjustment of oxygen stoichiometry after synthesis and compositions may be chosen allowing superconductivity at temperatures ...

SUM:
... for example, do not require adjustment of oxygen stoichiometry after synthesis, and compositions may be chosen allowing superconductivity at temperatures exceeding 100 K.

The novel compounds described herein have the same tetragonal layered perovskite-like structure of the parent compound T10.5Pb0.5CaSr2Cu207 comprising in sequence: a T10.5Pb0.50 layer with Tl/Pb occupying square comer-shared sites and oxygen distributed about the face centre; a SrO layer with ...

FOCUS - 8 OF 107 PATENTS

5,626,906

<=2> GET 1st DRAWING SHEET OF 3

May 6, 1997

Electrodes comprising conductive perovskite-seed layers for perovskite dielectrics

INVENTOR: Summerfelt, Scott R., Dallas, Texas
Beratan, Howard R., Dallas, Texas

ABST:
... layer and the conductive oxide layer each comprise the same metal. The metal should be conductive in its metallic state and should remain conductive when partially or fully oxidized. Generally, the perovskite-seed layer has a perovskite or perovskite-like crystal structure and lattice parameters which are similar to the perovskite dielectric layer formed thereon. At a given deposition temperature, the crystal quality and other properties of the perovskite dielectric will generally be enhanced by depositing it on ...

SUM:
... As used herein, the term "high-dielectric-constant" means a dielectric constant greater than about 50 at device operating temperature. As used herein the term "perovskite" means a material with a perovskite or perovskite-like

crystal structure. As used herein the term "dielectric", when used in reference to a perovskite, means a non-conductive perovskite, pyroelectric, ferroelectric, or high-dielectric-constant oxide material. The deposition of a ...

... structure. To facilitate perovskite crystal formation, perovskite dielectrics such as PZT have been deposited on some conductive perovskites such as YBa2Cu3O[7 - x]and (La,Sr)CoO3. Deposition of PZT on a substrate with a perovskite or perovskite-like crystal structure normally minimizes the formation of the pyrochlore phase and improves the properties of the perovskite dielectric. However, the materials used thus far for the deposition surface have several problems. For example, they typically involve new cations such ...

... layer each comprise the same metal. The metal should be conductive in its metallic state and should remain conductive when partially or fully oxidized, and when in a perovskite. Generally, the perovskite-seed layer has a perovskite or perovskite-like crystal structure and lattice parameters which are similar to the perovskite dielectric layer formed thereon. At a given deposition temperature, the crystal quality and other properties of the perovskite dielectric will generally be enhanced by depositing it on ...

DETDESC:

...
TABLE
...

ruthenate seed layer perovskite-like materials

FOCUS - 9 OF 107 PATENTS

5,611,854

Mar. 18, 1997

Seed crystals with improved properties for melt processing superconductors for practical applications

INVENTOR: Veal, Boyd W., Downers Grove, Illinois
Paulikas, Arvydas, Downers Grove, Illinois
Balachandran, Uthamalingam, Hinsdale, Illinois
Zhong, Wei, Chicago, Illinois

DETDESC:
... Although PbTiO3 is shown in the Table, other perovskites of the form RTiO3, when R is La or a rare earth are good candidates. EuTiO3 has a lattice parameter of 3,897 [Angstrom] . NdGaO3, and other perovskite-like oxides with the prototype GdFeO3 structure should also serve well. NdGaO3 is available as a commercial substrate material. Others may also be commercially available, particularly LaCrO3 which has many industrial applications.

Oxides with the GdFeO3 (...

FOCUS - 10 OF 107 PATENTS

5,602,080

<=2> GET 1st DRAWING SHEET OF 1

Feb. 11, 1997

Method for manufacturing lattice-matched substrates for high-T[c] superconductor films

INVENTOR: Bednorz, Johannes G., Wolfhausen, Switzerland
Mannhart, Jochen D., Thalwil, Switzerland
Mueller, Carl A., Hedingen, Switzerland
Schlom, Darrell G., State College, Pennsylvania

SUM:
... a close match-preferably approaching an ideal match-of the lattice parameters of a substrate-without a buffer layer-to a selected high-T[c

]superconductor material having a perovskite or a perovskite-like crystal structure can be achieved by a method comprising the following steps: Determining the relevant lattice constant or constants of the selected superconductor material; choosing a desired orientation of the superconductor layer to ...

... for the deposition of the superconductor.

One preferred method of the invention for manufacturing a lattice-matched substrate for a film of a selected high-T[c]superconductor material having a perovskite or perovskite-like crystal structure at a selected orientation relative to the film dimensions comprises the steps set forth below.

The preferred method of the invention includes the step of determining a relevant lattice constant or constants of the selected ...

... make the codeposition from separate sources each containing one or more of the materials combined to form the buffer layer.

Preferred substrate component materials include strontium titanate SrTiO3 and lanthanum aluminate LaAlO3 for perovskite-like superconductor materials such as YBa2Cu3O7 - delta .

In the following description, a preferred method for manufacturing crystalline substrate material having essentially the same lattice constant as the corresponding lattice constant of a ...

FOCUS - 11 OF 107 PATENTS

5,593,951

<=2> GET 1st DRAWING SHEET OF 4

Jan. 14, 1997

Epitaxy of high T[C]superconductors on silicon

INVENTOR: Himpsel, Franz J., Mt. Kisco, New York

SUM:

... first showed superconducting behavior in mixed copper-oxides, typically including rare earth and/or rare earth-like elements and alkaline earth elements, for example La, Ba, Sr, . . . , and having a perovskite-like structure.

Materials including the so called "1-2-3" phase in the Y-Ba-Cu-O system have been found to exhibit a superconducting transition temperature in excess of 77K. R. B. ...

FOCUS - 12 OF 107 PATENTS

5,590,053

<=2> GET 1st DRAWING SHEET OF 20

Dec. 31, 1996

Method of determining a space group

INVENTOR: Ito, Tatsuya, Kawasaki, Japan
Kawai, Masahito, Kawasaki, Japan
Yasukawa, Yoshihito, Kawasaki, Japan

DETDESC:

... present invention will be described with reference to FIG. 15 to FIG. 20. Let it be assumed here that a crystal as a target of analysis is one of LaGdSrCuO4. In the case of investigation into such a perovskite-like copper oxide superconductor, it is an effective technique of investigating a new substance to laminate partial structures to grasp a laminate structure

characteristic of the substance. The structure analysis of the target crystal by this technique will ...

FOCUS - 13 OF 107 PATENTS

5,589,284

<=2> GET 1st DRAWING SHEET OF 3

Dec. 31, 1996

Electrodes comprising conductive perovskite-seed layers for perovskite dielectrics

INVENTOR: Summerfelt, Scott R., Dallas, Texas
Beratan, Howard R., Dallas, Texas

ABST:

... layer and the conductive oxide layer each comprise the same metal. The metal should be conductive in its metallic state and should remain conductive when partially or fully oxidized. Generally, the perovskite-seed layer has a perovskite or perovskite-like crystal structure and lattice parameters which are similar to the perovskite dielectric layer formed thereon. At a given deposition temperature, the crystal quality and other properties of the perovskite dielectric will generally be enhanced by depositing it on ...

SUM:

... As used herein, the term "high-dielectric-constant" means a dielectric constant greater than about 50 at device operating temperature. As used herein the term "perovskite" means a material with a perovskite or perovskite-like crystal structure. As used herein the term "dielectric", when used in reference to a perovskite, means a non-conductive perovskite, pyroelectric, ferroelectric, or high-dielectric-constant oxide material. The deposition of a ...

... structure. To facilitate perovskite crystal formation, perovskite dielectrics such as PZT have been deposited on some conductive perovskite such as YBa2Cu3O[7-x]and (La,Sr)CoO3. Deposition of PZT on a substrate with a perovskite or perovskite-like crystal structure normally minimizes the formation of the pyrochlore phase and improves the properties of the perovskite dielectric. However, the materials used thus far for the deposition surface have several problems. For example, they typically involve new cations such ...

... layer each comprise the same metal. The metal should be conductive in its metallic state and should remain conductive when partially or fully oxidized, and when in a perovskite. Generally, the perovskite-seed layer has a perovskite or perovskite-like crystal structure and lattice parameters which are similar to the perovskite dielectric layer formed thereon. At a given deposition temperature, the crystal quality and other properties of the perovskite dielectric will generally be enhanced by depositing it on ...

DETDESC:

...

TABLE

...

ruthenate	seed layer	perovskites or perovskite-
*	*	like materials (e.g.

FOCUS - 14 OF 107 PATENTS

5,585,300

<=2> GET 1st DRAWING SHEET OF 5

Dec. 17, 1996

Method of making conductive amorphous-nitride barrier layer for high-dielectric-constant material electrodes

INVENTOR: Summerfelt, Scott R., Dallas, Texas

DETDESC:

...
TABLE
...

* * Conductive perovskite like

FOCUS - 15 OF 107 PATENTS

5,583,096

<=2> GET 1st DRAWING SHEET OF 8

Dec. 10, 1996

Superconductive compounds and process for producing said compounds

INVENTOR: Cavazos, Ramon G., Paseo de la Reforma 403, Primer Piso, Mexico D.F. 06500

DETDESC:
... A. Muller in their article entitled "Possible High Tc Superconductivity in Ba-La-Cu-O System". (Zeitschrift fur Physik B-Condensed Matter 64,189-193 (1986), reported: " . . . perovskite-like-mixed valent copper compound. Upon cooling, the samples show a linear decrease in resistivity, then an approximately logarithmic increase, interpreted as a beginning of localization. Finally, an abrupt decrease by ...

FOCUS - 16 OF 107 PATENTS

5,563,331

<=2> GET 1st DRAWING SHEET OF 3

Oct. 8, 1996

Magnetoresistive sensor utilizing a sensor material with a perovskite-like crystal structure

INVENTOR: Von Helmolt, Rittmar, Erlangen, Federal Republic of Germany
Wecker, Joachim, Roettenbach, Federal Republic of Germany

ABST:
A magnetoresistive sensor may be constructed with material having a perovskite-like crystal structure and an increased magnetoresistive effect. The material is based on the composition (A1)[1-x](A2)[x]MnO[z], with A1 (trivalent) selected from Y, La, or a lanthanide, A2 (bivalent) from an alkaline- ...

SUM:

BACKGROUND OF THE INVENTION

The present invention relates to a magnetoresistive sensor with a layer made of a sensor material that possesses a perovskite-like crystal structure and exhibits an increased magnetoresistive effect.

The general structure and operation of magnetoresistive sensors with thin films made of ferromagnetic transition metals are explained further in, for example, the book "Sensors", Vol. ...

... x]Se (cf. "Journal of Applied Physics," Vol. 38, No. 3, Mar. 1, 1967, pp. 959-964). A corresponding effect is also evident in Nd0.5Pb0.5MnO3 crystals; these crystals have a perovskite-like structure (cf. "Physics B," Vol. 155, 1989, pp. 362-365). However, the change in electrical resistance as a function of magnetic induction observed in these material systems is confined to low ...

... occur only to a reduced extent, in a sensor material that is the subject of a German patent application No. P 43 10 318.9 (not previously disclosed).

This material possesses a perovskite-like crystal structure and exhibits an increased magnetoresistive effect. A composition based on (A1)[1-x](A2)[x]MnO[x]is to be selected for the material, such that the trivalent constituent A1 at least contains ...

... sensor according to an embodiment of the present invention includes at least two layers, a first layer and a second layer. Each of the first and second layers is made of a sensor material that possesses a perovskite-like crystal structure and exhibits an increased magnetoresistive effect. The sensor material of each of the first and second layers has a composition based on (A1)[1-x](A2)[x]MnO[z], where A1 is a trivalent ...

DETDESC:

... indicated can also contain minimal impurities with less than 0.5 atomic percent of each impurity element. Exemplary embodiments for corresponding materials are therefore $La_{0.67}Ba_{0.33}MnO_3$, or $Pr_{0.5}Sr_{0.5}MnO_3$, or $Nd_{0.33}Ca_{0.67}MnO_3$, or $(Dy_{0.67}Mg_{0.33})(Mn_{0.8}Cu_{0.2})O_{2.9}$. All these materials have

a perovskite-like crystal structure and are characterized by an increased magnetoresistive effect M[r]of, in particular, more than 10%, and preferably more than 50%. The effect is thus considerably greater than in known Cu/Co multilayer systems.

...

... 1557-1559). According to the present invention, corresponding layers of the sensor material are advantageously deposited onto substrates whose respective crystalline unit cell has dimensions matched to the unit cell of the sensor material. Substrate materials that also have a perovskite-like crystal structure are therefore particularly suitable. Corresponding exemplary embodiments are $SrTiO_3$, MgO, $LaAlO_3$, $NdGaO_3$, $MgAl_2O_4$, or Y-stabilized ZrO_2 (abbreviated YSZ). In addition, however, Si substrates that are coated with a special intermediate ...

... [*1] a layer system comprising at least two layers, including:

a first layer; and

a second layer;

wherein each of said first and second layers comprises a sensor material that possesses a perovskite-like crystal structure and exhibits an increased magnetoresistive effect, such that the sensor material of each of said first and second layers has a composition based on (A1)[1-x](A2)[x]MnO[z], wherein A1 is a ...

... [*4] similar to said first layer and layers similar to said second layer.

[*5] 5. A magnetoresistive sensor according to claim 2; wherein the layer system is deposited on a substrate made of a material that has a perovskite-like crystal structure.

[*6] 6. A magnetoresistive sensor according to claim 1, wherein the first layer and the second layer have different thicknesses.

[*7] 7. A magnetoresistive sensor according to claim 6, wherein the layer system includes ...

... [*7] similar to said first layer and layers similar to said second layer.

[*8] 8. A magnetoresistive sensor according to claim 6, wherein the layer system is deposited on a substrate made of a material that has a perovskite-like crystal structure.

[*9] 9. A magnetoresistive sensor according to claim 1, wherein the layer system includes more than two layers which alternate between layers similar to said first layer and layers similar to said second layer.

[*10] 10. A magnetoresistive sensor according to claim 9, wherein the layer system is deposited on a substrate made of a material that has a

perovskite-like crystal structure.

[*11] 11. A magnetoresistive sensor according to claim 1, wherein the layer system is deposited on a substrate made of a material that has a perovskite-like crystal structure.

[*12] 12. A magnetoresistive sensor according to claim 1, wherein 0.25 </= x </= 0.75.

[*13] 13. A magnetoresistive sensor according to claim 1, wherein z = 3.

FOCUS - 17 OF 107 PATENTS

5,554,585

<=2> GET 1st DRAWING SHEET OF 1

Sep. 10, 1996

Method of forming a superconductor microstrip transmission line

INVENTOR: Simon, Randy W., Long Beach, California
Platt, Christine E., El Segundo, California
Lee, Alfred E., Torrance, California
Lee, Gregory S., West Los Angeles, California

REF-CITED:
... 61(1):28-35 (1973).
Geballe, "Paths to Higher Temperature Superconductors," Science, vol. 259, Mar. 12, 1993, pp. 1550-1551.
Geller, S., et al., "Crystallographic Studies of Perovskite-like Compounds. II. Rare Earth Aluminates," Acta. Cryst., 9:1019-1025 (1956).
Geller, S., "Crystallographic Studies of Perovskite-like Compounds. IV. Rare Earth Scandates, Vanadites, Galliates, Orthochromites," Acta Cryst., 10:243-248 (1957).
Gulyaev,, Yu V., et al., "YBa2Cu3O[7 - x]Films with a High-temperature ...

FOCUS - 18 OF 107 PATENTS

5,552,373

<=2> GET 1st DRAWING SHEET OF 2

Sep. 3, 1996

Josephson junction device comprising high critical temperature crystalline copper superconductive layers

INVENTOR: Agostinelli, John A., Rochester, New York
Mir, Jose M., Webster, New York
Lubberts, Gerrit, Penfield, New York
Chen, Samuel, Penfield, New York

DETDESC:
... can take any convenient form capable of permitting deposition of USCO" thereon as a thin film.

In a specifically preferred form of the invention SUB" is chosen from

materials that themselves exhibit a perovskite or perovskite-like crystal structure. Strontium titanate is an example of a perovskite crystal structure which is specifically preferred for use as a substrate. Lanthanum aluminate (LaAlO3), lanthanum gallium oxide (LaGaO3) and potassium tantalate are ...

FOCUS - 19 OF 107 PATENTS

5,527,567

<=2> GET 1st DRAWING SHEET OF 6

Jun. 18, 1996

Metalorganic chemical vapor deposition of layered structure oxides

INVENTOR: Desu, Seshu B., Blacksburg, Virginia
Tao, Wei, Blacksburg, Virginia
Peng, Chien H., Blacksburg, Virginia
Li, Tingkai, Blacksburg, Virginia
Zhu, Yongfei, Blacksburg, Virginia

SUM:
... 1961), 695; G. A. Smolenski, V. A. Isupov and A. I. Agranovskaya, Fiz Tverdogo Tela, 3, (1961), 895). These compounds have a pseudo-tetragonal symmetry and the structure is comprised of stacking of perovskite-like units between (Bi2O2)<2 + > layers along the pseudo-tetragonal c-axis. A large number of these compounds do not contain any volatile components in their sublattice that exhibits spontaneous polarization. The tendency for ...

FOCUS - 20 OF 107 PATENTS

5,523,283

<=2> GET 1st DRAWING SHEET OF 1

Jun. 4, 1996

L[a]AlO3 Substrate for copper oxide superconductors

INVENTOR: Simon, Randy W., Long Beach, California
Platt, Christine E., El Segundo, California
Lee, Alfred E., Torrance, California
Lee, Gregory S., West Los Angeles, California

REF-CITED:
... 61(1):28-35 (1973).
Gaballe, "Paths to Higher Temperature Superconductors," Science, vol. 259, Mar. 12, 1993, pp. 1550-1551.
Geller, S., et al., "Crystallographic Studies of Perovskite-like Compounds. II. Rare Earth Aluminates," Acta. Cryst., 9:1019-1025 (1956).
Geller, S., "Crystallographic Studies of Perovskite-like Compounds. IV. Rare Earth Scandates, Vanadites, Galliates, Orthochromites," Acta Cryst., 10:243-428 (1957).
Gulysev, Yu V., et al., "YBa2CU30[7-x]Films with a High-temperature ...

FOCUS - 21 OF 107 PATENTS

5,523,282

<=2> GET 1st DRAWING SHEET OF 1

Jun. 4, 1996

High-frequency substrate material for thin-film layered perovskite superconductors

INVENTOR: Simon, Randy W., Long Beach, California

Platt, Christine E., El Segundo, California
Lee, Alfred E., Torrance, California
Lee, Gregory S., West Los Angeles, California

REF-CITED:
... A., et al., "The Flux Shuttle-A Josephson Junction Shift Register Employing Single Flux Quanta," Proceedings of the IEEE, 61(1):28-35 (1973).
Geller, S., "Crystallographic Studies of Perovskite-like Compounds. Rare Earth Scandates, Vanadites, Galliates, Orthochromites," Acta Cryst., 10:243-251 (1957).
Gurvitch, M., et al., "Preparation and Substrate Reactions of Superconducting Y-Ba-Cu-O Films," ...

... in the Coprecipitation of Carbonate and Hydroxide Compounds of Lanthanum and Aluminum," Russian Journal of Inorganic Chemistry, vol. 22, No. 11, pp. 1622-1625, 1977.
S. Geller et al., "Crystallographic Studies of Perovskite-like Compounds. II. Rare Earth Aluminates," Acta Cryst., vol. 9, pp. 1019-1025, 1956.
J. Kilner et al., "Electrolytes for the High Temperature Fuel Cell; Experimental and Theoretical ...

FOCUS - 22 OF 107 PATENTS

5,519,234

<=2> GET 1st DRAWING SHEET OF 30

May 21, 1996

Ferroelectric dielectric memory cell can switch at least giga cycles and has low fatigue - has high dielectric constant and low leakage current

INVENTOR: Paz de Araujo, Carlos A., Colorado Springs, Colorado
Cuchiaro, Joseph D., Colorado Springs, Colorado
Scott, Michael C., Colorado Springs, Colorado
McMillan, Larry D., Colorado Springs, Colorado

ABST:
... s2 > . . . Sk xk < + ak > B1 y1 < + b1> B2 y2 < + b2 > . . . Bl yl < + bl> Q z < - 2> , where A1, A2 . . . Aj represent A-site elements in a perovskite-like structure, S1, S2 . . . Sk represent superlattice generator elements, B1, B2 . . . Bl represent B-site elements in a perovskite-like structure, Q represents an anion, the superscripts indicate the valences of the respective elements, the subscripts indicate the number of atoms of the element in the unit cell, and at least w1 and y1 are non-zero. Some of these materials are extremely low ...

SUM:
... 676 (1962) and Chapter 8 pages 241-292 and pages 624 & 625 of Appendix F of the Lines and Glass reference cited above. As outlined in section 15.3 of the Smolenskii book, the layered perovskite-like materials can be classified under three general types:

(I) compounds having the formula A m - 1 Bi2M m O 3m + 3 , where A = Bi<3 + > , Ba<2 + > , Sr< ...

... strontium titanates Sr2TiO4, Sr3Ti2O7 and Sr4Ti3O10; and

(III) compounds having the formula A m M m O 3m + 2 , including compounds such as Sr2Nb2O7, La2Ti2O7, Sr5TiNb4O17, and Sr6Ti2Nb4O20.

Smolenskii pointed out that the perovskite-like layers may have different thicknesses, depending on the value of m, and that the perovskite AMO3 is in principal the limiting example of any type of layered perovskite-like structure with m = infinity. Smolenskii also noted that if the layer with minimum thickness (m = 1) is denoted by P and the bismuth-oxygen layer is denoted by B, then the type I compounds may be described as . . . BP m BP m . . . . Further

Smolenskii noted that if m is a fractional number then the lattice contains perovskite-like layers of various thicknesses, and that all the known type I compounds are ferroelectrics. Similarly, Smolenskii noted that the type two compounds could be represented as . . . SP m SP m . . . where P is the perovskite-like layer of thickness m and S is the strontium-oxygen connecting layer, and that since the type I and type II compounds have similar perovskite-like layers, the existence of "hybrid" compounds such as . . . BP m SP n BP m SP m . . . "should not be ruled out", though none had been obtained at that time.

Up to now, these layered ferroelectric ...

... s2 > . . . Sk xk < + sk> B1 yl < + bl> B2 y2 < + b2 > . . . Bl yl < + bl> Q z < - 2> , where A1, A2 . . . Aj represent A-site elements in a perovskite-like structure, S1, S2 . . . Sk represent superlattice generator elements, B1, B2 . . . Bl represent B-site elements in a perovskite-like structure, Q represents an anion, the superscripts indicate the valences of the respective elements, the subscripts indicate the average number of atoms of the element in the unit cell, and at least w1 and y1 are non-zero. Preferably, the A- ...

... layered superlattice material comprises a material having a localized structure, within a grain or other larger or smaller unit, which localized structure contains predominately repeatable units containing one or more perovskite-like layers and one or more intermediate non-perovskite-like layers spontaneously linked in an interdependent manner.

In another aspect the invention provides a non-volatile ferroelectric memory comprising: a ferroelectric memory cell including a layered superlattice ...

DETDESC:

... curves as shown in FIG. 5C, which show fatigue of less than 30%, which is much less than for any ferroelectric material on which endurance tests had been performed in the prior art. It was realized that the SrBi4Ti4015 was one of the layered perovskite-like materials catalogued by Smolenskii, and thought that perhaps the natural layered structure of these materials might be the source of the low-fatigue property. Other devices were fabricated having the structure shown in FIG. 2C, i.e. a ...

... flexible than the lattice of a ferroelectric material. Turning to FIG. 13, a layered superlattice material 92 is illustrated. Smolenskii recognized that what we call the layered superlattice materials spontaneously form into layers 94 with a perovskite-like structure which alternate with layers 96 having a simpler structure. Depending on the material, the perovskite-like layers 94 may include one or a plurality of linked layers of perovskite-like octahedrons 90. As an example, FIG. 14 shows a unit cell of the material ABi2B2< + 5> O9, which is the formula for strontium bismuth tantalate (SrBi2Ta2O9) and other layered superlattice materials, such as tantalum, niobium, and tungsten, having a element with a valence of + 5 in the B-site. In this structure, each perovskite-like layer 94 includes two layers of octahedrons 90 which are separated by layers 96 of a material that does not have a perovskite-like structure. In this material the primitive unit cell consists of two perovskite layers 94 and two non-perovskite layers 96, since the structure shifts between the layers 98A and 98B. In FIG. ...

... O15, which is the formula for strontium bismuth titanate (SrBi4Ti4O15) and other layered superlattice materials having an element, such as titanium, hafnium, and zirconium, having a valence of + 4 in the B-sites. In this material each the perovskite-like layer 94 has four layers of octahedrons 90.

As the understanding of what Smolenskii called a layered perovskite-like structure increased, the inventors have realized that these materials are more than a substance which spontaneously forms in layers. This is seen most easily by an example. Strontium bismuth tantalate (SrBi2Ta2O9) can be considered to

be ...

... in the following definition: (B) a material having a localized structure, within a grain or other larger or smaller unit, which localized structure contains predominately repeatable units containing one or more perovskite-like layers and one or more intermediate non-perovskite-like layers spontaneously linked in an interdependent manner.

It has been discovered that the layered superlattice materials catalogued by Smolenskii et al. are all likely candidates for fatigue free switching ferroelectrics and dielectric materials that are resistant to ...

... x2 < + s2 > . . . Sk xk < + sk> B1 y1 < + b1> B2 y2 < + b2 > . . . Bl yl < + bl> Q z < - 2> ,

where A1, A2 . . . Aj represent A-site elements in the perovskite-like structure, which may be elements such as strontium, calcium, barium, bismuth, lead, and others S1, S2 . . . Sk represent superlattice generator elements, which usually is bismuth, but can also be materials such as yttrium, scandium, lanthanum, antimony, chromium, thallium, and other elements with a valence of + 3, B1, B2 . . . Bl represent B-site elements in the perovskite-like structure, which may be elements such as titanium, tantalum, hafnium, tungsten, niobium, zirconium, and other elements, and Q represents an anion, which generally is oxygen but may also be other elements, such as fluorine, ...

... [*2] s2 > . . . Sk xk < + sk> B1 y1 < + b1> B2 y2 < + b2 > . . . Bl yl < + bl> Q z < - 2> , where A1, A2 . . . Aj represent A-site elements in a perovskite-like structure, S1, S2 . . . Sk represent superlattice generator elements, B1, B2 . . . Bl represent B-site elements in a perovskite-like structure, Q represents an anion, the superscripts indicate the valences of the respective elements, the subscripts indicate the average number of atoms of the element in the unit cell, and at least w1 and y1 are non-zero.

[*3] 3. A ...

FOCUS - 23 OF 107 PATENTS

5,504,041

<=2> GET 1st DRAWING SHEET OF 5

Apr. 2, 1996

Conductive exotic-nitride barrier layer for high-dielectric-constant materials

INVENTOR: Summerfelt, Scott R., Dallas, Texas

DETDESC:

...

TABLE

...

* * Conductive perovskite like materials

FOCUS - 24 OF 107 PATENTS

5,489,548

<=2> GET 1st DRAWING SHEET OF 3

Feb. 6, 1996

Method of forming high-dielectric-constant material electrodes comprising sidewall spacers

INVENTOR: Nishioka, Yasushiro, Tsukuba, Texas, Japan
Summerfelt, Scott R., Dallas, Texas

Park, Kyung-Ho, Tsukuba, Japan
Bhattacharya, Pijush, Midnapur, India

DETDESC:

...
TABLE
...

* * Conductive perovskite like

FOCUS - 25 OF 107 PATENTS

5,478,610

<=2> GET 1st DRAWING SHEET OF 5

Dec. 26, 1995

Metalorganic chemical vapor deposition of layered structure oxides

INVENTOR: Desu, Seshu B., Blacksburg, Virginia
Tao, W., Blacksburg, Virginia

SUM:
... 34, (1961), 695; G. A. Smolenski, V. A. Isupov and A. I. Agranovskaya, Fiz Tverdogo Tela, 3, (1961), 895). These compounds have pseudo-tetragonal symmetry and the structure is comprised of stacking of perovskite-like units between (Bi2O2)<2 + > layers along the pseudo-tetragonal c-axis. A large number of these compounds do not contain any volatile components in their sublattice that exhibits spontaneous polarization. The tendency for ...

FOCUS - 26 OF 107 PATENTS

5,468,679

<=2> GET 1st DRAWING SHEET OF 27

Nov. 21, 1995

Process for fabricating materials for ferroelectric, high dielectric constant, and integrated circuit applications

INVENTOR: Paz de Araujo, Carlos A., Colorado Springs, Colorado
Scott, Michael C., Colorado Springs, Colorado
Cuchiaro, Joseph D., Colorado Springs, Colorado
McMillan, Larry D., Colorado Springs, Colorado

SUM:
... 676 (1962) and Chapter 8 pages 241-292 and pages 624 & 625 of Appendix F of the Lines and Glass reference cited above.

As outlined in section 15.3 of the Smolenskii book, the layered perovskite-like materials can be classified under three general types:

(I) compounds having the formula A m-1 Bi2M m O 3m + 3 , where A = Bi<3 + > , Ba<2 + > , Sr< ...

... s2> . . . Sk xk < + sk> B1 y1 < + b1> B2 y2 < + b2> . . . B1 y1 < + b1> Q z < - 2> ,

where A1, A2 . . . Aj represent A-site elements in a perovskite-like structure, S1, S2 . . . Sk represent superlattice generator elements, B1, B2 . . . B1 represent B-site elements in a perovskite-like structure, Q represents an anion, the superscripts indicate the valences of the respective elements, the subscripts indicate the average number of atoms of the element in the unit cell, and at least w1 and y1 are non-zero. Preferably, the A- ...

DETDESC:
... compatible with, or can be designed to be compatible with, the other

materials commonly used in integrated circuits, such as silicon and gallium arsenide.

The class of materials are those disclosed by Smolenskii as having a layered perovskite-like structure, as discussed in the Background of the Invention. It has been realized that these materials are more than a substance which spontaneously forms in layers. This is seen most easily by an example. Strontium bismuth tantalate (SrBi2Ta2O9) can ...

... in the following definition: (B) a material having a localized structure, within a grain or other larger or smaller unit, which localized structure contains predominately repeatable units containing one or more perovskite-like layers and one or more intermediate non-perovskite-like layers spontaneously linked in an interdependent manner.

It is well-known that compounds having the perovskite structure may be described in terms of the general formula ABQ3, where A and B are cations and Q is an anion. In the ...

Pat. No. 5468679, *

FOCUS

... flexible than the lattice of a ferroelectric material. Turning to FIG. 13, a layered superlattice material 92 is illustrated. Smolenskii recognized that what we call the layered superlattice materials spontaneously form into layers 94 with a perovskite-like structure which alternate with layers 96 having a simpler structure. Depending on the material, the perovskite-like layers 94 may include one or a plurality of linked layers of perovskite-like octahedrons 90. As an example, FIG. 14 shows a unit cell of the material ABi2B2< + 5> O9, which is the formula for strontium bismuth tantalate (SrBi2Ta2O9) and other layered superlattice materials, such as tantalum, niobium, and tungsten, having a element with a valence of + 5 in the B-site. In this structure, each perovskite-like layer 94 includes two layers of octahedrons 90 which are separated by layers 96 of a material that does not have a perovskite-like structure. In this material the primitive unit cell consists of two perovskite layers 94 and two non-perovskite layers 96, since the structure shifts between the layers 98A and 98B. In FIG. ...

... O15, which is the formula for strontium bismuth titanate (SrBi4Ti4O15) and other layered superlattice materials having an element, such as titanium, hafnium, and zirconium, having a valence of + 4 in the B-sites. In this material each the perovskite-like layer 94 has four layers of octahedrons 90.

It has been discovered that the layered superlattice materials catalogued by Smolenskii et al. are all likely candidates for fatigue free switching ferroelectrics and dielectric materials that are resistant to ...

... x2 < + s2> . . . Sk xk < + sk> B1 y1 < + b1> B2 y2 < + b2> . . . Bl yl <bl> Q z < - 2> ,

where A1, A2 . . . Aj represent A-site elements in the perovskite-like structure, which may be elements such as strontium, calcium, barium, bismuth, lead, and others S1, S2 . . . Sk represent superlattice generator elements, which usually is bismuth, but can also be materials such as yttrium, scandium, lanthanum, antimony, chromium, thallium, and other elements with a valence of + 3, B1, B2 . . . Bl represent B-site elements in the perovskite-like structure, which may be elements such as titanium, tantalum, hafnium, tungsten, niobium, zirconium, and other elements, and Q represents an anion, which generally is oxygen but may also be other elements, such as fluorine, ...

FOCUS - 27 OF 107 PATENTS

5,447,908

<=2> GET 1st DRAWING SHEET OF 1

Sep. 5, 1995

Superconducting thin film and a method for preparing the

same

INVENTOR: Itozaki, Hideo, Hyogo, Japan
Tanaka, Saburo, Hyogo, Japan
Fujita, Nobuhiko, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

SUM:
... structure. The term of quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to Perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygendeficient perovskite or the like.

The superconducting thin film may be also another type of superconductor consisting mainly of a compound oxide represented by the formula:

THETA 4(PHI 1-q ,Ca q) m Cu ...

5,447,906

Sep. 5, 1995

Thin film high TC oxide superconductors and vapor deposition methods for making the same

INVENTOR: Chaudhari, Praveen, Briarcliff Manor, New York
Gambino, Richard J., Yorktown Heights, New York
Koch, Roger H., Amawalk, New York
Lacey, James A., Mahopac, New York
Laibowitz, Robert B., Peekskill, New York
Viggiano, Joseph M., Wappingers Falls, New York

SUM:
... areas.

It is another object of the present invention to provide continuous, smooth copper oxide superconductive films exhibiting superconductivity at temperatures in excess of 40o K. and methods for making these films, where the films exhibit perovskite-like structure.

It is another object of this invention to provide transition metal oxide superconductive films including a rare earth element, or rare earth-like element, where the films exhibit superconductivity at temperatures greater than 40o ...

... earth-like element, B is an alkaline earth element, and y is sufficient to satisfy valence demands of the composition.

It is another object of the present invention to provide smooth, continuous copper oxide superconducting films having a perovskite-like crystal structure and exhibiting superconductivity at temperatures in excess of 40o K., and to provide methods for making these films.

SUMMARY OF THE INVENTION

The films of this invention are oxide superconductors exhibiting superconductivity at temperatures in excess of ...

... addition to being continuous, smooth, and of excellent compositional uniformity. The Cu oxide films are therefore considered to be unique examples of this class of films, as are the processes for making them.

Typically, the films are characterized by a perovskite-like crystalline structure, such as those described in more detail by C. Michel and B. Rayeau in Revue Dde.

Chimie Minerale, 21, p. 407 (1984). These films are formed by a ...

FOCUS - 29 OF 107 PATENTS

5,439,878

<=2> GET 1st DRAWING SHEET OF 21

Aug. 8, 1995

Method for preparing copper oxide superconductor containing carbonate radicals

INVENTOR: Kinoshita, Kyoichi, Hoya, Japan
Yamada, Tomoaki, Higashimurayama, Japan

SUM:
... novel superconducting material.
Description of the Prior Art

Several types of copper oxide superconductors have been discovered since high-To superconductivity was detected in the La-Ba-Cu-O system. Superconductivity would arise from the layered perovskite-like structure having CuO6 octahedra, or CuO5 pyramids, or CuO2 square planes as a building unit. The layered perovskite-like structure and a sufficient carrier concentration of the material are essential factors for making the material superconducting as indicated by Osamura & Zhang (Japan. J.Appl.Phys.26, L2094-L2096, 1987). ...

FOCUS - 30 OF 107 PATENTS

5,439,876

<=2> GET 1st DRAWING SHEET OF 5

Aug. 8, 1995

Method of making artificial layered high T c superconductors

INVENTOR: Graf, Volker, Wollerau, Switzerland
Mueller, Carl A., Hedingen, Switzerland

DETDESC:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One material particularly suited as a substrate in the epitaxial growth of high T c superconductor material is strontium titanate, SrTiO3, which forms crystals like perovskite (FIG. 1). Each titanium ion 1 is octahedrally surrounded by six oxygen ions 2, the bigger strontium ions 3 being disposed in the spaces in between. At room temperature, ...

FOCUS - 31 OF 107 PATENTS

5,426,092

<=2> GET 1st DRAWING SHEET OF 14

Jun. 20, 1995

Continuous or semi-continuous laser ablation method for depositing fluorinated superconducting thin film having basal plane alignment of the unit cells deposited on non-lattice-matched substrates

INVENTOR: Ovshinsky, Stanford R., Bloomfield Hills, Michigan
Young, Rosa, Troy, Michigan

SUM:
... growth of a crystalline superconducting material in a manner as if mimicking the orientation of a substrate having an identical lattice structure

without the presence of such a substrate lattice structure. Simply stated, an "epitaxial-like" perovskite superconducting material grown on a non-lattice-matched substrate would nonetheless be characterized by a lattice structure identical to the lattice structure which would be present if the material was grown on a perovskite substrate. Thus, " ...

FOCUS - 32 OF 107 PATENTS

5,424,282

<=2> GET 1st DRAWING SHEET OF 5

Jun. 13, 1995

Process for manufacturing a composite oxide superconducting wire

INVENTOR: Yamamoto, Susumu, Hyogo, Japan
Murai, Teruyuki, Hyogo, Japan
Kawabe, Nozomu, Hyogo, Japan
Awazu, Tomoyuki, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

DETDESC:

... term of "quasiperovskite type structure" means any oxide that can be considered to have such a crystal structure-that is similar to perovskite-type oxides and may include an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

In practice, the element ct is preferably selected from Ba, Sr and/or Ca and the element beta is preferably selected from Y, La and/or lanthanid such as Sc, Ce, Gd, Ho, Er, Tin, Y b, ...

FOCUS - 33 OF 107 PATENTS

5,423,285

<=2> GET 1st DRAWING SHEET OF 27

Jun. 13, 1995

Process for fabricating materials for ferroelectric, high dielectric constant, and integrated circuit applications

INVENTOR: Paz de Araujo, Carlos A., Colorado Springs, Colorado
Cuchiaro, Joseph D., Colorado Springs, Colorado
Scott, Michael C., Colorado Springs, Colorado
McMillan, Larry D., Colorado Springs, Colorado

SUM:

... 676 (1962) and Chapter 8 pages 241-292 and pages 624& 625 of Appendix F of the Lines and Glass reference cited above.

As outlined in section 15.3 of the Smolenskii book, the layered perovskite-like materials can be classified under three general types:

(I) compounds having the formula A m-1 Bi2M m O 3m + 3 , where A = Bi<3 + > , Ba<2 + > , Sr< ...

... s2> . . . Sk xk < + sk> B1 y1 < + b1> B2 y2 < + b2> . . . Bl yl < + bl> Q z < - 2> , where A1, A2 . . . Aj represent A-site elements in a perovskite-like structure, S1, S2 . . . Sk represent superlattice generator elements, B1, B2 . . . Bl represent B-site elements in a perovskite-like structure, Q represents an anion, the superscripts indicate the valences of the respective elements, the subscripts indicate the average number of atoms of the element in the unit cell, and at least w1 and y1 are non-zero. Preferably, the A- ...

DETDESC:

... compatible with, or can be designed to be compatible with, the other materials commonly used in integrated circuits, such as silicon and gallium arsenide.

The class of materials are those disclosed by Smolenskii as having a layered perovskite-like structure, as discussed in the Background of the Invention. It has been realized that these materials are more than a substance which spontaneously forms in layers. This is seen most easily by an example. Strontium bismuth tantalate (SrBi2Ta2O9) can ...

... in the following definition: (B) a material having a localized structure, within a grain or other larger or smaller unit, which localized structure contains predominately repeatable units containing one or more perovskite-like layers and one or more intermediate non-perovskite-like layers spontaneously linked in an interdependent manner.

It is well-known that compounds having the perovskite structure may be described in terms of the general formula ABQ3, where A and B are cations and Q is an anion. In the ...

... flexible than the lattice of a ferroelectric material. Turning to FIG. 13, a layered superlattice material 92 is illustrated. Smolenskii recognized

that what we call the layered superlattice materials spontaneously form into layers 94 with a perovskite-like structure which alternate with layers 96 having a simpler structure. Depending on the material, the perovskite-like layers 94 may include one or a plurality of linked layers of perovskite-like octahedrons 90. As an example, FIG. 14 shows a unit cell of the material ABi2B2< + 5> O9, which is the formula for strontium bismuth tantalate (SrBi2Ta2O9) and other layered superlattice materials, such as tantalum, niobium, and tungsten, having a element with a valence of + 5 in the B-site. In this structure, each perovskite-like layer 94 includes two layers of octahedrons 90 which are separated by layers 96 of a material that does not have a perovskite-like structure. In this material the primitive unit cell consists of two perovskite layers 94 and two non-perovskite layers 96, since the structure shifts between the layers 98A and 98B. in FIG. ...

... O15, which is the formula for strontium bismuth titanate (SrBi4Ti4O15) and other layered superlattice materials having an element, such as titanium, hafnium, and zirconium, having a valence of + 4 in the B-sites. In this material each the perovskite-like layer 94 has four layers of octahedrons 90.

It has been discovered that the layered superlattice materials catalogued by Smolenskii et al. are all likely candidates for fatigue free switching ferroelectrics and dielectric materials that are resistant to ...

... Sk xk < + sk> B1 y1 < + b1> B2 y2 < + b2> . . . Bl yl < + bl> Q z < - 2> ,tm (1)

where A1, A2 . . . Aj represent A-site elements in the perovskite-like structure, which may be elements such as strontium, calcium, barium, bismuth, lead, and others S1, S2 . . . Sk represent superlattice generator elements, which usually is bismuth, but can also be materials such as yttrium, scandium, lanthanum, antimony, chromium, thallium, and other elements with a valence of + 3, B1, B2 . . . Bl represent B-site elements in the perovskite-like structure, which may be elements such as titanium, tantalum, hafnium, tungsten, niobium, zirconium, and other elements, and Q represents an anion, which generally is oxygen but may also be other elements, such as fluorine, ...

FOCUS - 34 OF 107 PATENTS

5,409,890

Apr. 25, 1995

Process for producing an elongated sintered article

INVENTOR: Yamamoto, Susumu, Hyogo, Japan
Kawabe, Nozomu, Hyogo, Japan
Awazu, Tomoyuki, Hyogo, Japan
Murai, Teruyuki, Hyogo, Japan

SUM:
... term quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

The sintering operation of the powder mixture is carried out at temperature which is higher than 600o C. but is not higher than the lowest melting point of any component in the material powder to be sintered. If the sintering temperature exceeds the ...

FOCUS - 35 OF 107 PATENTS

5,401,715

<=2> GET 1st DRAWING SHEET OF 1

Mar. 28, 1995

Semiconductor substrate having a superconducting thin film

INVENTOR: Itozaki, Hideo, Hyogo, Japan
Harada, Keizo, Hyogo, Japan
Fujimori, Naoji, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

DETDESC:
... term quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

An atomic ratio of the lanthanide element "Ln":Ba:Cu is preferably 1:2:3 as is defined by the formula but the atomic ratio is not restricted strictly to this ratio. In fact, the other compound oxides having ...

FOCUS - 36 OF 107 PATENTS

5,389,603

<=2> GET 1st DRAWING SHEET OF 5

Feb. 14, 1995

Oxide superconductors, and devices and systems comprising such a superconductor

INVENTOR: Batlogg, Bertram J., New Providence, New Jersey
Cava, Robert J., Bridgewater, New Jersey

DETDESC:
... microscopy indicate a basically orthorhombic crystal structure, but there are also indications that, at least for some of the inventive compounds, the structure may be weakly monoclinic. Both of these possibilities are intended to be included in the term "perovskite-like" or analogous terms. Diffraction studies have also revealed the presence of a variety of long period long range ordered superlattices (typically in the ab plane).

FIG. 2 shows the field (225 Oe)-cooled ...

We claim:

[*1] 1. An article comprising a superconductive element comprising at least one superconductive material having a perovskite-like crystal structure and nominal formula (Pb2A2 Cu')BCu2O8 + delta with (A selected from the group consisting of Sr, Ba, Sr and Ba, Sr and Ca, and Sr, Ba and Ca; Cu' is selected from the group consisting of ...

... [*1] parallel to the ab- plane; and wherein the composition is selected such that the superconductive material has a transition temperature of at least about 30K.

[*2] 2. An article comprising a superconductive element comprising at least one superconductive material having a perovskite-like crystal structure and nominal formula (X2A2Cu') BCu2O8 + delta , where X is selected from the group consisting of Pb, Pb and Bi, Pb and Tl, and Pb, Bi and Tl, with X being at least 50 atomic % of ...

FOCUS - 37 OF 107 PATENTS

5,362,710

<=2> GET 1st DRAWING SHEET OF 2

Nov. 8, 1994

Process for preparing high Tc superconducting material

INVENTOR: Fujita, Nobuhiko, Hyogo, Japan
Kobayashi, Tadakazu, Hyogo, Japan
Itozaki, Hideo, Hyogo, Japan
Tanaka, Saburo, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

SUM:
... quasi-perovskite type oxide means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

The present invention also provides a process for producing the abovementioned superconducting material, characterized by sintering a mixture of the following powders:

an oxide, carbonate, nitrate or sulfate of one element "A" selected from ...

FOCUS - 38 OF 107 PATENTS

5,356,674

<=2> GET 1st DRAWING SHEET OF 2

Oct. 18, 1994

Process for applying ceramic coatings using a plasma jet carrying a free form non-metallic element

INVENTOR: Henne, Rudolf, Boeblingen, Federal Republic of Germany
Weber, Winfried, Leinfelden-Echterdingen, Federal Republic of Germany
Schiller, Guenter, Gerlingen, Federal Republic of Germany
Schnurnberger, Werner, Stuttgart, Federal Republic of Germany
Kabs, Michael, Hanau, Federal Republic of Germany

SUM:
... materials are oxidized materials, for example, spinels and perovskites on a nickel or cobalt or nickel-cobalt basis. It is, however, also conceivable to apply all possible kinds of spinels and perovskites in accordance with the inventive process. This also applies to spinel-like and perovskite-like compounds and to non oxidized compounds, for example, nitrides, halides, carbides, etc., with nitrogen or halogens or also non-metallic compounds,

methane or acetylene then being carried along as non-metallic element by the ...

FOCUS - 39 OF 107 PATENTS

5,354,733

<=2> GET 1st DRAWING SHEET OF 21

Oct. 11, 1994

Copper oxide superconductor containing carbonate radicals

INVENTOR: Kinoshita, Kyoichi, Hoya, Japan
Yamada, Tomoaki, Higashimurayama, Japan

SUM:
... 2. Description of the Prior Art

Several types of copper oxide superconductors have been discovered since high-T c superconductivity was detected in the La-Ba-Cu-O system. Superconductivity would arise from the layered perovskite-like structure having CuO6 octahedra, or CuO5 pyramids, or CuO2 square planes as a building unit. The layered perovskite-like structure and a sufficient carrier concentration of the material are essential factors for making the material superconducting as indicated by Osamura & Zhang (Japan.J.Appl.Phys.26, L2094-L2096, 1987). ...

FOCUS - 40 OF 107 PATENTS

5,340,796

<=2> GET 1st DRAWING SHEET OF 5

Aug. 23, 1994

Oxide superconductor comprising Cu, Bi, Ca and Sr

INVENTOR: Cava, Robert J., Bridgewater, New Jersey
Sunshine, Steven A., Berkeley Heights, New Jersey

ABST:
Novel superconductive oxides are disclosed. The oxides all have layered perovskite-like crystal structure and manifest superconductivity above about 77K. An exemplary material has composition Bi2.2Sr2Ca0.8Cu2O8. Other materials are described by the nominal formula X 2 + x M n - x Cu n - ...

SUM:
... high temperature superconductors has been reported since publication of the above seminal papers. Most of the work deals with YBa2Cu3O x (the so-called 1-2-3 compound) and related compounds.

In all of these compounds the superconducting phase is perovskite-like, typically having orthorhombic crystal structure, and the compounds that exhibit high (i.e., T c > 77K) temperature superconductivity generally contain one or more rare earth elements.

The discovery of high T c superconductivity in some ...

... likely to be stable high T c superconductors, with T c s likely to be above 100K.

The novel phases all have a crystal structure that is closely related to that of the above described 80K compound and thus are perovskite-like. They differ from each other essentially only in the number of crystal planes between the two Bi-O double planes that bound the unit cell in the c-direction, or by the size of the supercell. The composition of the ...

DETDESC:
... in added layers of M and Cu between the Bi-O double layers and are expected to result in one or more phases of stable high T c superconductive

material.

All of the inventive phases have layered perovskite-like crystal structure, and the existence of relatively weak bonding between at least some layers may be the cause of the observed relatively high ductility of the inventive materials. It will be appreciated that by "perovskite-like" we mean not only the prototypical, truly cubic structure, but very significantly distortions therefrom.

Material specification in accordance with the invention depends upon the nature of the intended use. For power transmission, or any other currentcarrying ...

What is claimed is:

[*1] 1. An article comprising material perovskite-like structure and of nominal composition X 2 + x M 4 - x Cu3O10 + 0.5 +/- delta , where [x = p/q < 0.4, and p and q are positive integers] 0 </= x < 0.4, X is Bi and Pb, ...

FOCUS - 41 OF 107 PATENTS

5,338,721

<=2> GET 1st DRAWING SHEET OF 5

Aug. 16, 1994

Process for manufacturing a superconducting composite

INVENTOR: Yamamoto, Susumu, Hyogo, Japan
Murai, Teruyuki, Hyogo, Japan
Kawabe, Nozomu, Hyogo, Japan
Awazu, Tomoyuki, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

DETDESC:
... quasi-perovskite type structure" means any oxide that can be considered to have such a crystal structure that is similar to perovskite-type oxides and may include an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

In practice, the element alpha is preferably selected from Ba, Sr and/or Ca and the element beta is preferably selected from Y, La and/or lanthanid such as Sc, Ce, Gd, Ho, Er, Tm, Yb, Lu and the ...

FOCUS - 42 OF 107 PATENTS

5,332,722

<=2> GET 1st DRAWING SHEET OF 3

Jul. 26, 1994

Nonvolatile memory element composed of combined superconductor ring and MOSFET

INVENTOR: Fujihira, Mitsuka, Yokohama, Japan

DETDESC:
... term quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

Another superconducting compound oxide which can be used by the present invention is represented by the general formula:

(M,Sr)2CuO 4- delta

in which M stands for Y or La and ...

FOCUS - 43 OF 107 PATENTS

5,328,892

Jul. 12, 1994

Oxide superconductor composition and a process for the production thereof

INVENTOR: Manako, Takashi, Tokyo, Japan
Shimakawa, Yuichi, Tokyo, Japan
Kubo, Yoshimi, Tokyo, Japan

SUM:

... following formulae:

TlSr 3 - x Y x Cu2O7(IA)

wherein 0.1 </= x </= 1, and

TlSr 4 - x Y x Cu3O9(IB)

wherein 0.1 </= x </= 2. Unit cells of the layered perovskite-like crystal structures of these compositions of the formulae (IA) and (IB) may be shown respectively as follows:

TlO/SrO/CuO2/Sr or Y/CuO2/SrO(IX)

TlO/SrO/CuO2/Sr or Y/ ...

FOCUS - 44 OF 107 PATENTS

5,296,458

<=2> GET 1st DRAWING SHEET OF 4

Mar. 22, 1994

Epitaxy of high T c superconducting films on (001) silicon surface

INVENTOR: Himpsel, Franz J., Mt. Kisco, New York

SUM:

... first showed superconducting behavior in mixed copper-oxides, typically including rare earth and/or rare earth-like elements and alkaline earth elements, for example La, Ba, Sr, . . . , and having a perovskite-like structure. Materials including the so called "1-2-3" phase in the Y-Ba-Cu-O system have been found to exhibit a superconducting transition temperature in excess of 77K.

R. B. ...

FOCUS - 45 OF 107 PATENTS

5,286,712

<=2> GET 1st DRAWING SHEET OF 2

Feb. 15, 1994

High TC superconducting film

INVENTOR: Fujita, Nobuhiko, Hyogo, Japan
Kobayashi, Tadakazu, Hyogo, Japan

Itozaki, Hideo, Hyogo, Japan
Tanaka, Saburo, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

SUM:
... quasi-perovskite type oxide means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

The present invention also provides a process for producing the abovementioned superconducting material, characterized by sintering a mixture of the following powders:

an oxide, carbonate, nitrate or sulfate of one element "A" selected from ...

FOCUS - 46 OF 107 PATENTS

5,283,465

<=2> GET 1st DRAWING SHEET OF 5

Feb. 1, 1994

Superconducting lead on integrated circuit

INVENTOR: Yamazaki, Shunpei, Tokyo, Japan

DETDESC:
... subjected to supplemental annealing at 500o-600o C. for 1-2 hours as illustrated in FIG. 1(B). The supplemental annealing allows the superconducting ceramic material to form a modulated perovskite-like structure and, as a result, a high critical temperature is realized. On the substrate, there are provided superconducting leads 10 and 10' for interconnection among devices and contacts formed in or on the semiconductor substrate and a ...

FOCUS - 47 OF 107 PATENTS

5,278,140

<=2> GET 1st DRAWING SHEET OF 5

Jan. 11, 1994

Method for forming grain boundary junction devices using high T c superconductors

INVENTOR: Chaudhari, Praveen, Briarcliff Manor, New York
Chi, Cheng-Chung J., Yorktown Heights, New York
Dimos, Duane B., Montclair, New Jersey
Mannhart, Jochen D., Metzingen, New York, Federal Republic of Germany
Tsuei, Chang C., Chappaqua, New York

SUM:
... first showed superconducting behavior in mixed copper-oxides, typically including rare earth and/or rare earth-like elements and alkaline earth elements, for example La, Ba, Sr, . . . , and having a perovskite-like structure. Materials including the so called "1-2-3" phase in the Y-Ba-Cu-O system have been found to exhibit a superconducting transition temperature in excess of 77K. R. B. ...

FOCUS - 48 OF 107 PATENTS

5,252,547

<=2> GET 1st DRAWING SHEET OF 1

Oct. 12, 1993

Method of forming an inorganic protective layer on an oxide superconducting film

INVENTOR: Itozaki, Hideo, Hyogo, Japan
Tanaka, Saburo, Hyogo, Japan
Fujita, Nobuhiko, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

SUM:
... term of quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to Perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

The superconducting thin film may be also another type of superconductor consisting mainly of a compound oxide represented by the formula:

THETA 4(PHI 1 - q ,Ca q) m Cu ...

FOCUS - 49 OF 107 PATENTS

5,249,525

<=2> GET 1st DRAWING SHEET OF 11

Oct. 5, 1993

Spark-discharge lithography plates containing image-support pigments

INVENTOR: Lewis, Thomas E., E. Hampstead, New Hampshire
Nowak, Michael T., Gardner, Massachusetts

DETDESC:
... A perspective view of the first layer, labeled "Layer 0", appears in FIG. 6E. As shown in these figures, the spinel structure contains a number of octahedral sites for metal ions. Like perovskite structures spinels may also be defective, an example being gamma-Fe2O3. A spinel structure may also be intergrown with other structures.

In spinel compounds useful as image-support pigments, the ...

FOCUS - 50 OF 107 PATENTS

5,244,874

Sep. 14, 1993

Process for producing an elongated superconductor

INVENTOR: Yamamoto, Susumu, Hyogo, Japan
Kawabe, Nozomu, Hyogo, Japan
Awazu, Tomoyuki, Hyogo, Japan

DETDESC:
... term quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

Another superconducting compound oxide which can be prepared by the present invention is represented by the general formula:

(M, Sr)2CuO 4 - delta

in which M stands for Y or La and ...

FOCUS - 51 OF 107 PATENTS

5,241,191

<=2> GET 1st DRAWING SHEET OF 1

Aug. 31, 1993

Cubic perovskite crystal structure, a process of preparing the crystal structure, and articles constructed from the crystal structure

INVENTOR: Agostinelli, John A., Rochester, New York
Chen, Samuel, Penfield, New York

DETDESC:

... 1, PA-2, PA-3, PA-4 and PA-5, cited above and here incorporated by reference, can be employed. Highly compatible substrates are materials that themselves exhibit a perovskite or perovskite-like crystal structure. Strontium titanate is an example of a perovskite crystal structure which is specifically preferred for use as a substrate. Lanthanum aluminate (LaAlO3), lanthanum gallium oxide (LaGaO3) and potassium tantalate are ...

FOCUS - 52 OF 107 PATENTS

5,236,894

Aug. 17, 1993

Process for producing a superconducting thin film at relatively low temperature

INVENTOR: Tanaka, Saburo, Itami, Japan
Itozaki, Hideo, Itami, Japan
Higaki, Kenjiro, Itami, Japan
Yazu, Shuji, Itami, Japan
Jodai, Tetsuji, Itami, Japan

SUM:

... crystal structure. The term quasi-perovskite type means a structure which can be considered to be similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

Still another example of the above-mentioned compound oxide is compound oxides represented by the general formula:

THETA 4(PHI 1 - q , Ca q) m Cu n O p + ...

FOCUS - 53 OF 107 PATENTS

5,221,660

<=2> GET 1st DRAWING SHEET OF 1

Jun. 22, 1993

Semiconductor substrate having a superconducting thin film

INVENTOR: Itozaki, Hideo, Hyogo, Japan
Harada, Keizo, Hyogo, Japan
Fujimori, Naoji, Hyogo, Japan
Yazu, Shuji, Hyogo, Japan
Jodai, Tetsuji, Hyogo, Japan

DETDESC:

... term quasi-perovskite type means a structure which can be considered to have such a crystal structure that is similar to perovskite-type oxides and includes an orthorhombically distorted perovskite or a distorted oxygen-deficient perovskite or the like.

An atomic ratio of the lanthanide element "Ln":Ba:Cu is preferably 1:2:3 as is defined by the formula but the atomic ratio is not restricted strictly to this ratio. In fact, the other compound oxides having ...

FOCUS - 54 OF 107 PATENTS

5,212,148

<=2> GET 1st DRAWING SHEET OF 1

May 18, 1993

Method for manufacturing oxide superconducting films by laser evaporation

INVENTOR: Roas, Bernhard, Erlangen, Federal Republic of Germany
Endres, Gerhard, Forchheim, Federal Republic of Germany
Schultz, Ludwig, Bubenreuth, Federal Republic of Germany

SUM:

... yet exactly established. This initial product is then converted, by applying a heat and oxygen treatment, into the material with the desired superconducting phase.

The superconductive metal-oxide phases, to be obtained in this manner, can have perovskite-like crystal structures and, in the case of YBa2Cu3O 7 - x , whereby 0 < x < 0.5, have an orthorhomic structure (compare, for example, "Europhysics Letters", Vol. 3, No. 12, Jun. 15, 1987, pages ...

FOCUS - 55 OF 107 PATENTS

5,183,799

<=2> GET 1st DRAWING SHEET OF 16

Feb. 2, 1993

Superconducting materials including La-Sr-Nb-O, Y-Ba-Nb-O, La-Sr-Nb-Cu-O, and Y-Ba-Nb-Cu-O

INVENTOR: Ogushi, Tetsuya, Kagoshima, Japan
Hakuraku, Yoshinori, Kagoshima, Japan
Ogata, Hisanao, Ibraki, Japan

ABST:

... V, Nb, Ta, T, Zr or Hf; 0 < x < 1; 0 < z < 1; i = 1, 3/2 or 2; 0 < y </= 4; Gis F, Cl or N; delta is oxygen defect, and having a perovskite-like crystal structure, show superconductivity at a temperature higher than the liquid nitrogen temperature.

SUM:

BACKGROUND OF THE INVENTION

This invention relates to a superconducting material having a perovskite-like crystal structure and a superconducting part using the same, particularly to a superconducting material suitable for having a high superconducting transition temperature (Tc), and a process for producing the same.

Heretofore, ...

DETDESC:

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The superconducting materials of this invention have a perovskite-like crystal structure and represented by the formulae:

(L x A 1 - x) i MO y(1)

(L x A 1 - x) i M 1 - z Cu z ...

... by laminating this superconducting material with other films of electrical insulating material. It is preferable to laminate a plurality of film-like layers alternately, respectively. Further, it is preferable to use as an insulating material a perovskite-like ceramic of the same series.

Further, in the above-mentioned formulae (1) and (2), a total of valence number (p) of L, A and M, or L, A, M and Cu, and the valence number y of ...

... OMITTED p SYMBOL OMITTED = SYMBOL OMITTED y SYMBOL OMITTED +/- 0.5

Further, it is preferable to include M of the valence of two.

More in detail, the material represented by the formula (1) has a perovskite-like crystal structure and has as the L element at least one element selected from the group consisting of scandium (Sc), yitrium (Y), and lanthanide elements of atomic numbers 57 to 71 (La to Lu) belonging to the group ...

... Ta) belonging to the group Vb of the periodic table and titanium (Ti), zirconium (Zr) and hafnium (Hf) belonging to the group IVb of the periodic table, these element being able to include Cu.

The oxide superconducting material having the perovskite-like crystal structure of this invention has as a fundamental constitution an octahedron having the M element which is an atom belonging to the group Vb or IVb as its center and 6 oxygen atoms. Since this material has defect of oxygen, that is, one or ...

... a mutual action of strong attraction necessary for forming a hole pair or electron pair showing a superconducting phenomenon at a temperature of 150K or higher.

The oxide superconducting material of this invention has the perovskite-like crystal structure as shown in FIGS. 1 and 2. These drawings show unit lattices of the materials represented by the formulae:

(L x A 1 - x) i MO y(1)

and (...

... formula (4) with at least one element selected from those of the group IVb and Vb, the total amount of the elements of the group IVb and Vb can exceed the amount of Cu.

It is also possible to produce an oxide superconducting powder having a perovskite-like crystal structure containing M element mainly by mixing a powder of oxide material represented by (L x A 1 - x) i CuO y , wherein x is 0 < x < 1; ...

... Cu:M = 1:1, carrying out substitution reaction between Cu and M element in vacuum, and finally pulverizing the final reaction product.

It is further possible to produce an oxide superconducting powder having a perovskite-like crystal structure and containing M element mainly by depositing in vacuum a film of pure metal of M element selected from the elements of groups IVb and Vb on outer surface of oxide ceramic ...

... 1, 3/2 or 2; y is 0 < y </= 4, containing the M element mainly (M being